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Simulation Based Acquisition

A State-of-the-Art Report

John Davis
Research Engineer
IIT Research Institute

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13. ABSTRACT (*Maximum 200 Words*)

This report describes what Simulation Based Acquisition (SBA) is, the events that have shaped its formulation so far, and its current status. It discusses the need for a faster and more efficient manner for acquiring and modifying military systems, and how the SBA methodology can aid in meeting this need. The report reviews areas of impact made by SBA, and provides an overview of the forces affecting its evolution. It also provides a set of reference internet sites for use in further investigation of the subject.

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Simulation Based Acquisition (SBA):

Introduction

As we move into the 21st century, the acquisition community as a whole, and specifically the DoD acquisition community, needs to move into a virtual environment to meet the challenges of modernization, affordability, and timeliness.

We continue to have the necessity of developing and maintaining modern weapons systems to provide U.S. forces with both a technological and training advantage in any future conflict or action. However, due to current and anticipated funding, the costs to provide programs and equipment to achieve this advantage must be reduced. In addition, the rapid rate at which technology is advancing requires that we also reduce acquisition time to remain at the forefront. The current Government acquisition process must be streamlined and made more efficient. Systems must be developed to work together as force multipliers. Thus, simulations and simulators must also work together in order to verify this interaction.

Simulation Based Acquisition (SBA) is a methodology for achieving this reduction in cost and scheduling. It is a new paradigm for the acquisition of materials within the DoD community.

I. The Purpose of SBA

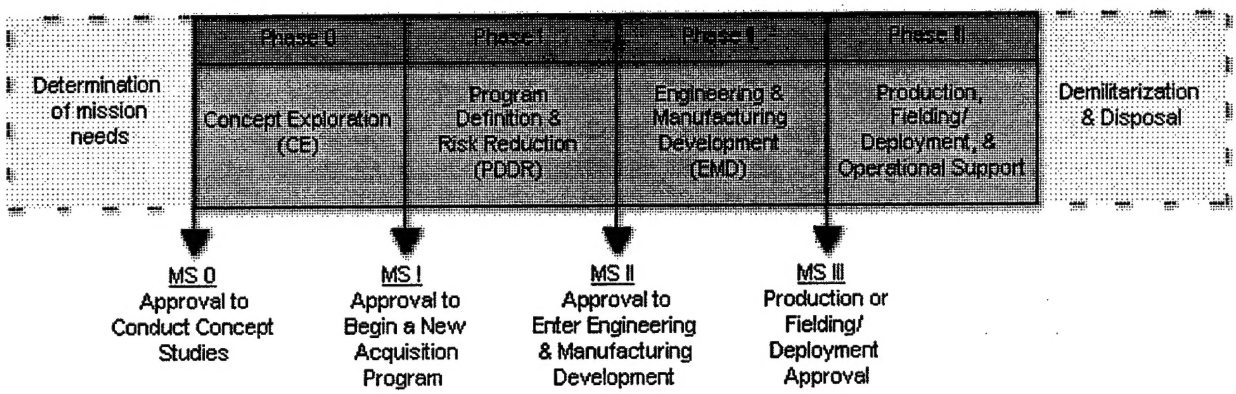
"The purpose of SBA is to develop an acquisition process in which DoD and industry are enabled by the robust, collaborative use of simulation technology that is integrated across acquisition phases and programs. The goals of SBA are to

- Substantially reduce the time, resources, and risk associated with the entire acquisition process.
- Increase the quality, military worth and supportability of fielded systems, while reducing total ownership costs throughout the total life cycle.
- Enable integrated product and process development (IPPD) across the entire acquisition life cycle." [1]

"Simulation Based Acquisition is an iterative, integrated product and process approach to acquisition that enables the warfighting, resource allocation, and acquisition communities, through modeling and simulation, to evaluate cost as an independent variable over the system's entire lifecycle and within the DoD's systems of systems, before entering production."[2] This definition clearly shows the complexity that must be addressed in implementing SBA. SBA is an integrated product and process development methodology, enabled by the robust use of modeling and simulation. The process envisioned is that of a seamless transfer of data and interoperability throughout the life cycle of a product. This process expands the initial concept of using M&S for improved acquisition to a total life-cycle approach for reducing costs. Cost is considered here in the context of Total Ownership Cost (TOC). SBA is the methodology that has been chosen by the DoD to reduce the TOC of military systems. It has also been successfully utilized by private industry as well.

Dr Patricia Sanders, Office of the Under Secretary of Defense (Acquisition and Technology), has made it clear that SBA is not just technology, but a new paradigm requiring changes in the culture of the acquisition community as well as the process and environment.[3]

SBA is utilized from the initial idea or concept for a system through development, testing, fielding, logistical support, and on to system retirement as shown below in its relationships to the program milestones. Figure 1 below shows the life-cycle for a system.



MS	Program Phase	Simulation Activity	Exit Criteria
0	Concept Formulation	Develop Prototype	The prototype shows a viable system
1	Program Definition & Risk Reduction	Enhance Prototype Model Addresses Performance Issues & Constraints	System meets both Performance Rates & Cost Constraints
2	Engineering & Manufacturing Development	Transfer Models to Development Contractors Evaluate Contractor Model In Synthetic Environment	System meets detailed Performance Requirements
3	Production, T&E, Fielding /Deployment Operation Support	Use Model to Evaluate Production Models	Model Meets Constraints Problems Reproduced in Synthetic Environment

Figure 1 - The Acquisition Life-Cycle

II. History of SBA

In June of 1993, Dr. Anita Jones, Director Defense Research & Engineering, established the Acquisition Task Force in Modeling & Simulation (ATFM&S). This task force came to the following conclusions: "1) the effective, integrated use of M&S in the acquisition process is being impeded by the lack of an overall M&S architecture; 2) the lack of this M&S architecture has led to not getting the most out of the investment that is being made in M&S for acquisition;

3) clearly designated leadership and an appropriate coordinating mechanism are required to stimulate progress in the creative application of M&S to the acquisition process; 4) additional education and training on the capabilities and limitations of M&S is required for all participants in the acquisition process; and 5) it is time to apply advanced M&S and related tools to enhance real acquisition programs.[4]

Several directives were enacted within DoD to bring about this change in methodology. The more important of these are describe in the rest of this paragraph. DoD Directive 5000.1 encourages the use of M&S to reduce time, resources, and risk associated with acquisitions. DoD Directive 5000.2 directs the application of accredited M&S be applied throughout the system life-cycle. DoD Directive 5000.59 established DoD policy and assigned responsibilities for the management of M&S, established the DoD Executive Council for Modeling and Simulation, and established the Defense Modeling and Simulation Office (DMSO). It also authorized the development of the DoD Modeling and Simulation (M&S) Master Plan. – DoD 5000.59-P, which was published in October 1995.

In his memorandum of 10 September 1994, The Honorable Paul Kaminski, Under Secretary of Defense, designated "the High Level Architecture as the standard technical architecture for all DoD simulations." He also stated that "the Department shall cease further development or modification of all simulations which have not achieved, or are not in the process of achieving, HLA compliance by the first day of fiscal year (FY) 1999, and shall retire any non-compliant simulations by the first day of FY 2001." The necessity for developing SBA tools and techniques that help to meet this HLA compliance cannot be stressed to strongly.

Dr. Jacques Gansler, the Deputy Under Secretary of Defense (Acquisition and Technology) and the Defense Affordability Council have committed to SBA as a means for reducing the total ownership cost and system development time for new systems and for current systems that are being significantly modified. Dr. Gansler made three main points in his book, "Defense Conversion." They are: 1) the need for even more of an effort at the Joint level to set requirements such that there is minimum duplication within the DoD; 2) the need to minimize the amount of paperwork involved by going to a *paperless* acquisition process; and 3) the need for a better integration of the civilian industry base with the DoD.

The U. S. Army has taken the lead in implementation of SBA, recently broadening the scope of SBA to include requirements definition and training as well, calling their approach SMART. SMART stands for Simulation & Modeling for Acquisition, Requirements, and Training. The Military Deputy to the Assistant Secretary of the Army Research Development and Acquisition (ASA-RDA), LTG Paul Kern has started an annual conference / symposium to keep the Army acquisition community up to date on the latest policy, techniques and successes associated with SBA.

The U. S. Navy is utilizing a simulation based approach in its development of the next generation of surface ships, starting with the DD-21 program.

The U. S. Air Force is using modeling and simulation in the development of the Joint Strike Fighter.

In the commercial world, Boeing's development of the Boeing-777 aircraft, and Chrysler's development of the Dodge Intrepid were both accomplished with similar approaches. Both achieved significant reduction in cost over previous development efforts.

The DoD community must also consider including logistical support, training, and effectiveness in a combat situation as well as reducing cost and schedule.

III. The SBA Methodology

The SBA paradigm is analogous to the current software prototyping methodology. The Military Deputy to ASA-RDA is convinced that the not only is the necessary technology and expertise now available for SBA to work and to work well, but also that the current acquisition cycle must change to meet the evolving nature of possible threats. The old acquisition joke – "Better, Cheaper, Faster, choose any two" - is no longer acceptable. New systems must be developed that are all three.

Nicholas Karagelen[5] has pointed out that 80% of the total lifetime cost of a system is determined by Milestone I. Thus, the use of modeling and simulation to explore the design space early in the program is a significant key to reducing the total ownership cost of a system.

A. Impact Areas

There are three areas that must be successfully addressed for SBA to provide the DoD with a workable solution to the need for an acquisition methodology that is streamlined, fast and flexible: 1) Changes in technology, 2) Development of a standardized acquisition process, and 3) acceptance of and advocacy by those involved.

1. Simulation Technology

The rapid advancement of computer hardware and information technology techniques has made a simulation based approach to acquisition not only possible but practical as well. Increases in computing power, visualization techniques, storage capacity along with a reduction in cost now allow the development of models that provide a capability for vastly increased "what-if" scenarios.

This "what-if" approach coupled with spiral prototyping allows for the rapid evaluation of several options and the selection of those options which reduce cost and improve reliability. The greater fidelity of the models developed by this incremental refining provides for a greater confidence level of the user community. This confidence is necessary for simulation based designed to be accepted.

2. Standard Acquisition Process

Although, on the surface, it may appear to be a dichotomy to try to have a process that is both standardized and flexible, it is not. A standardized process reduces the time and effort for acquisition personnel to familiarize themselves with the process and be able to effectively use it. In addition, the use of M&S technology and spiral prototyping allows the flexibility to try multiple configurations and parameters before having to come to a final decision on the system architecture.

Within SBA, the standard requirement for continuing to the next event or milestone in the acquisition process is the substantiation of the completion of the previous step via a well-documented and validated simulation model. This model must be comprehensive enough to consider all major systems and subsystem of the physical entity to be acquired, to evaluate the cost factors, and to validate the requirement set.

Concept Formulation and Requirements

The use of modeling and simulation provides for a reduced cost in the concept formulation phase of a system, aids in ensuring that the basic concept and requirements of a system be defined and developed with a high degree of accuracy. It does this by the use of modeling and simulation to perform a series of "what-ifs" provides the basis for conceptualizing a new system, and playing with the concept to develop the requirements needed to successfully implement the system. Requirements are considered complete when simulation results indicate that the stated requirements achieve mission success and are capable of being implemented in accordance with a feasible cost and schedule. By defining the requirements, testing them, and then iterating, SBA allows the user to better articulate the requirements for the system before any physical construction is begun. It also, provides for completing most of the risk analysis for the system via models during this early stage as long as data and information

The Army uses a Simulation Support Plan (SSP) to provide the Program Manager (PM) with a tool to use throughout the entire acquisition process to assist in the development of modeling and simulation requirements. The SSP must remain a living document changing in response to revision of the program. This way it can remain an effect tool for the PM to manage his/her M&S resources. The SSP also provides a means for providing visibility of the programs M&S up the chain of command. This, in turn, can assist the DoD in managing its M&S resources by reducing duplication and encouraging reuse by allowing other PMs to leverage the use of M&S already developed. Figure 2 shows the SSP Roadmap overlaid on the Acquisition Strategy. The Air Force uses a Simulation and Modeling Plan (SAMP) in a similar manner.

With SBA being able to refine requirements early in the life cycle, it provides the acquisition community with the capability to make changes faster than the current methodology. Making changes early in the life cycle is cheaper to do, and allows the management team an easier decision making process for modifying the system to provide the best solution to the problem at hand, before the changes cause serious cost or schedule impact. The magnitude and complexity of current and projected weapons systems exacerbate the design challenge that faces the acquisition community.

Design

The system design is considered baselined when a comprehensive model has been developed, which can be shown to meet functional and performance requirements through a validated simulation.

The use of a common schema greatly enhances the capability of a system to accurately link multiple design domains and levels of representation. Linking the physical, component, architectural and system levels not only within a system but also across levels allows rapid configuration changes and the execution of analysis based on campaign scenarios.

Again, as with all SBA steps, the desired cost and schedule must be met in the simulation, as exit criteria from this phase.

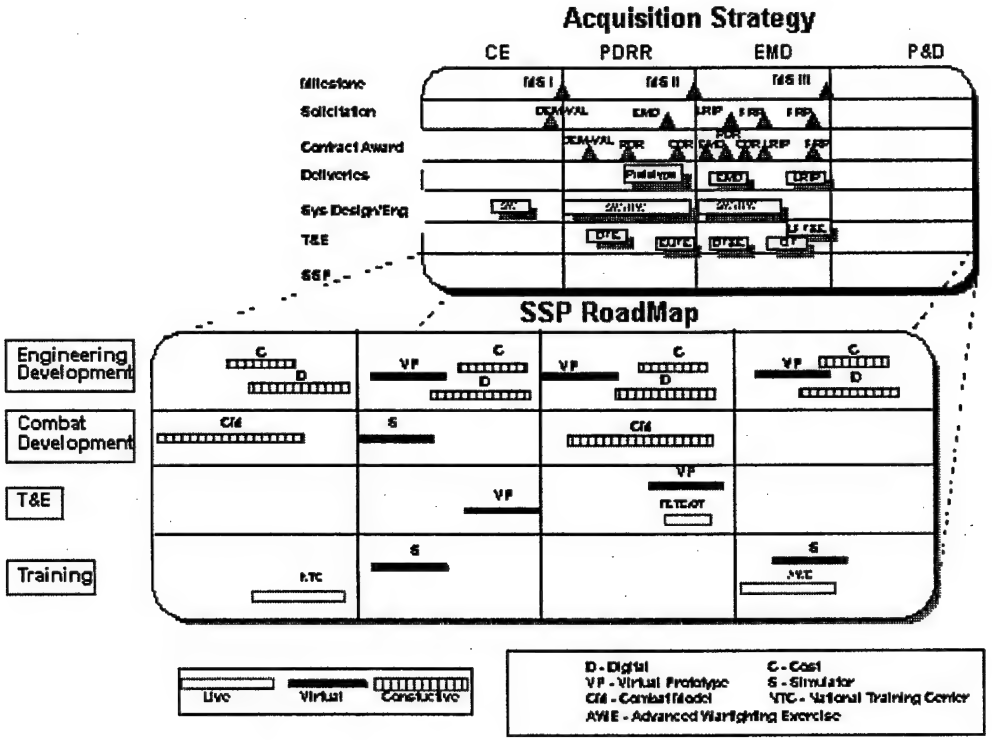
Testing

The purpose of testing is to validate the system. Within a simulated system, the goal is to validate the model being run. The goal of SBA in testing is to save time and money over the old method, while providing more comprehensive testing capability. More comprehensive testing includes the ability to stress to the point of failure without having the cost of repair, to test subsystems and parts down to a localized component, and to run the tests at slower or faster that real-time. This and the ability to find the problems early in the development life-cycle facilitate design changes earlier, thus reducing cost.

"The old paradigm was to test a company of tanks. The new paradigm will be to test a platoon, but simulate a battalion." John Haug, Director, Technical Mission, US Army Text & Evaluation Command (TECOM). Industry methodology examples from GM and Ford are given in the "Systems Acquisition Manager's Guide for implementing Simulation Based Acquisition."[2]

To summarize, the SBA approach is an iterative process that is calculated to converge on a best solution, considering requirements, cost, and schedule.

Figure 2 - SSP Roadmap overlaid on the Acquisition Strategy



3. Culture

The biggest obstacle to the success of SBA is not technologies or processes; it is people. In the "Systems Acquisition Manager's Guide for implementing Simulation Based Acquisition"[2], Johnson et al, responses to the question "what does SBA mean to you?" answers ranged from "SBA is the use of a virtual prototype to make program decisions" to "If we're doing modeling correctly, then the simulations will tell us when we need to start a new program…" to "Nintendo for leaders."[2] In "A Road Map for Simulation Based Acquisition,"[1] the need for collaboration between the acquisition, logistics, training, and warfighting communities is both clearly and strongly mandated. Like nearly every change that has been made to the entrenched way in which something is done, there is resistance to the change – sometimes blatant and sometimes subtle.

B. An Example Methodology

The Ford Motor Company's Nine Step Simulation Methodology Process

In its attempts to lower the cost and improve the reliability of its product, Ford has developed a simulation based methodology for developing its new model automobiles. The simple descriptive overview of the steps involved shows how M&S are used.

Step 1: Defining the Opportunity

This is more than looking at immediate needs; it goes beyond the present. The team looks at the capabilities and limitations of current technologies and those that are expected in the near-term future in relation to needs.

Step 2: Setting the Scope and Objectives

The acquisition strategy is laid out. The planned development is compared to the available and planned technology to ensure that M&S will support the needs of the project. Feasibility and cost are also considered at this time, as are critical risks.

Step 3: Collecting the Data

Before designing or building the models, data is collected this is of sufficient resolution to meet the scope defined in Step 2. Care is taken to ensure that neither extra time nor cost is incurred by collecting data at too detailed a level nor possible problems by not collecting enough detail.

Step 4: Building the Model(s)

During this phase, the data collected is transformed from a set of information into a working model. The tacit (internal) information is formalized and captured in the design. Thus, this step takes the knowledge from various individuals and develops an explicit model that documents the collective knowledge.

Step 5: Verify and Validate the Model(s)

The model(s) built in step 4 are first verified to ensure that the model(s) performs as expected. After the model is verified, a subject matter expert validates the model(s) ensuring that compliance with the real world entity. For use within the DoD arena, an accreditation process would need to be added to this step.

Step 6: Experimenting Through Simulation

In this step, the model is exercised to determine if the established set of requirements, as implemented in the model, meet the need of the user community. Multiple iteration can be run using differing variations of the requirements or parameters within the established requirements. Utilizing the simulation allows the developer to get feedback from the user and make modifications more rapidly and cheaper than building multiple physical prototypes. The simulation also allows testing the limits of the envisioned system.

Step 7: Analyzing the Results

Having exercised the modeled system, the results from the various runs are compared to the expected results. If the answers are not as expected, various options are available. The expected results should be checked to ensure that they are correct. Additional data may need to be collected to improve the model, or the data may need to be obtained or utilized at a finer level of granularity to improve the fidelity of the model. In some cases, the analyzed outputs will indicate that iteration back to Steps 2 or 3. Perhaps an evaluation of the results will show that the scope itself needs to be modified.

Step 8: Implementing the Results

Once the iterations of Steps 1-7 allow convergence at the optimum design of the system, then the physical system itself can be built. Aspects of the entire life-cycle should have been analyzed by this time – maintenance, logistics, and training, as well as the initial cost and performance.

Step 9: Documentation

Of course the documentation of the system started back in Step 1, to capture the understanding of the system for implementation in the model. However, now all this data is finalized, cataloged and the developed tools and knowledge should be made available in a central repository (e.g. MSRR).

By working the problems with the system early in the procurement process, we avoid the high cost of change later on in the life-cycle; thus, reducing the Total Ownership Cost (TOC).

IV. The Importance of SBA

The importance of SBA relates to the use of this methodology to reduce both the cost and time necessary to produce a new system, and to produce higher quality systems. SBA is a paradigm shift from the traditional "waterfall" method of Requirements Phase, Design Phase, Development Phase, Test & Integration Phase, Acceptance Testing Phase, and Fielding, then starting over because it's obsolete.

SBA improves on this in several ways. First, interim products are software models and databases, which can be captured, placed under configuration control, and then used as the basis for the next iteration in the acquisition process. By controlling the interim products, the development team can return and reevaluate the system at any point along the development path. This allows for a quick impact assessment to requirement changes such as a change in threat status, capabilities or tactics. SBA also encourages starting of the following phase of the cycle before the current phase is complete, allowing a further schedule compression not available in the waterfall methodology providing for a method of rapidly evaluating multiple design options.

SBA is an integral part of the DoD's plan for joint interoperability. The use of HLA federations and the development of software factories appear to be indispensable in insuring that joint interoperability is met with maximum reusability and thus minimize necessary costs.

V. The Current Status of SBA

OSD SBA Initiatives

SBA was mandated by OSD, which generated DoD 5000.2 directing the use of M&S in support of acquisition activities. OSD has also launched an SBA Joint Task Force. The Defense Modeling and Simulation Office (DMSO) is leading a DoD-wide effort to establish a common technical framework for use within SBA with its High Level Architecture (HLA) initiative. DMSO has also developed a Modeling and Simulation Resource Repository, which is available on the Internet (http://www.msrr.dmso.mil). This site links to each of the individual services resource repositories as well as several other sites containing information on utilizing modeling and simulation.

Army SBA Initiatives

The U.S. Army has been active in SBA since its inception. In April 1997, the Army was involved in the SBA Conference (OSD Initiative). The Army conducted its first SBA Conference in January 1998. This conference was sponsored by Secretary of the Army for Research, Development and Acquisition(SARDA) and US Army Simulation, Training and Instrumentation Command (STRICOM), and was restricted to Government and invited personnel only. The second Army SBA Conference was redesignated to the 1999 Simulation and Modeling for Acquisition, Requirements, and Training (SMART) Conference and was held in January of 1999. This conference had breakout sessions to discuss the impact of the SMART (SBA) paradigm on the areas of requirements, standards, test & evaluation, operations, training, and logistics and how it can be used even more effectively in the future. In addition other breakout groups discussed the impact and future of the SMART Enterprise Model and virtual

environments. SARDA hosted this event. Proceedings and Presentations from this can be found at http://sba.iitri.org. The next SMART conference is being planned for January 2000.

SBA is being extensively utilized in the development of the Crusader Program, and the US Army Tank-Automotive and Armaments Command, Research Development and Engineering Center's (TACOM-TARDEC) Virtual Prototyping Group is utilizing SBA to investigate the dynamic performance of ground vehicles. This is being performed throughout the life-cycle process. They are using virtual environments to evaluate new designs prior to selection and testing, as well as for supporting development efforts, and product improvement changes. Additionally, TACOM-TARDEC has used SBA techniques to evaluate accidents and field mishaps.

Other programs that are scheduled to use or are using the SBA approach include the Grizzly/Wolverine trainer, and the Future Scout Cavalry System (FSCS) program.

SARD-DO & STRICOM are the leading proponents of SMART within the Army.

Navy SBA Initiatives

The US Navy is currently preparing for a modeling and simulation conference to be held in the August 1999 time frame. The agenda is not published yet, but SBA is expected to be one of the major topic areas.

Additionally, the Navy is utilizing the SBA paradigm to develop it new line of surface ships within the SC-21 (Surface Combatants for the 21st Century) Program. Specifically, in the development of the first of this series of ships, the DD-21 destroyer. The DD-21 system will provide an advanced level of land attack in support of the ground campaign and contribute to battlespace dominance in littoral operations.

"The DD-21 Smart Product Model (SPM) is a digital version of the ship system, consisting of product model data and performance and behavior characteristics of the ship. Product model data is a combination of geometric and non-geometric engineering data, which describes the physical and logical configuration of the ship, including elements of the ship's information architecture. Data within the SPM will be of sufficient detail to support modeling and simulation verification of ship's system performance with respect to operational requirements. The SPM will support analysis in the areas of operation, engineering, life cycle cost, test planning and performance predictions, maintenance, manufacturing and training." [5]

Information on Navy Models and Simulations can be found at the Navy Modeling & Simulation Information System (NMSIS) web site, http://navmsmo.hq.navy.mil .

Air Force SBA Initiatives

The Air Force is using modeling and simulation in several of its programs.

The Joint Strike Fighter Program is one of the programs for which the US Air Force is utilizing modeling and simulation for acquisition and development The Joint Strike Fighter (JSF) Program Office is meeting the challenge extended by the DoD Acquisition Reform Initiatives to involve the warfighters up front in weapon system development, exploit the tools of modeling and simulation, and treat cost as an independent variable by the use of simulation-assisted wargaming analyses.

More information on this program can be found at http://www.combatsim.com/jsf_pro2.htm , and http://www.boeing.com/defense-space/military/jsf/jsfecon.htm .

The Air Force has also been instrumental in the genesis of the Joint Modeling and Simulation System (JMASS). JMASS is being developed to provide a common software environment to use in the development and execution of interoperable and reusable model components. It will provide a systems-level architecture that will specify:

- A structure for simulations and their component models,
- The interrelationship between their components models, and
- The principles and guidelines governing their design and evolution.

JMASS is targeting the engineering and engagement level modeling requirements at the systems level for the acquisition and T&E communities, and will define the systems level architecture and standards to develop, execute, and analyze simulations.[7]

Additional information on the JMASS initiative can be found at http://jmass.wpafb.af.mil/ .

VI. The Future of SBA

The SBA approach is a whole new paradigm for the acquisition community. As such it is meeting resistance from those that do not wish to change, and from those who do not wish to take the effort to learn something new; however, the major problem is sheer inertia. Direction from the top has been provided and impetus to transition mandated, now it requires the whole-hearted acceptance of all involved, which will necessitate the realization that the entire life cycle of a product is interdependent and with the SBA approach iterative as well. This rethinking of how to acquire new systems will require a significant change from the way systems are currently being developed. Two major initiatives that are being utilized to further the completeness of the SBA approach and improve acceptance – the Common Technical Framework and the SBA Roadmap are discussed below.

A. Common Technical Framework

The DMSO, http://www.dmso.mil/ , is heading a DoD-wide effort to establish a Common Technical Framework (CTF), which is comprised of three component parts: High Level Architecture (HLA), Data Standards (DS), and Conceptual Models of the Mission Space (CMMS).

HLA is an approach to developing a hierarchy of simulation federations. There are 10 basic rules, which define the relationships among federation components. HLA also consists of an object model template and an interface specification.

The development of a conceptual model of the mission space for each of the DoD mission areas is the basic mission of the CMMS. This conceptual model would be used to develop and provide a set of consistent and authoritative modeling and simulation representations, a set of common tools for the both conceptual analysis and development of interoperable models of current and planned systems, human behavior and the encompassing environment for use within the HLA federations, and access to needed data.

The Data Standards Program has the objective of establishing policies, procedures, and methodologies for interoperability standards for M&S data. The establishment of the Data Standards also has goals of sharing and reusing data that is available (i.e. timely) and cost effective.

B. SBA Roadmap

The development of a readily identifiable, unified DoD approach is needed, and the SBA Roadmap recommends that it be a phased approach. The Roadmap calls for a series of tests to be conducted to identify issues and improve the SBA process. "The focus of these experiments will, among others, be on development of the architecture and the creation of collaborative environments."[8] Several Cost Benefits Analyses will need to be performed to move from intuitive to documented benefits of SBA. Included in this phased approach is the development of a methodology to accredit the various models that are needed. The Roadmap also calls for the creation of a group to define and develop the architecture upon which to grow the SBA approach. The complete SBA Roadmap can be found at http://www.acq-ref.navy.mil/sba/ .

VII. Conclusion

The need to incorporate the robust use of M&S technology to produce systems as a whole as compared to the current "one piece at a time" is becoming more apparent all the time. The need to use M&S technology to pass information seamlessly from one phase and community to the next continues to grow at an increasing rate. The necessity for a single digital representation of the battlefield in which to virtually test and train is now called for by LTG Paul Kern.

As Dr. Patricia Sanders has said, "In combat, we do not want a fair fight. We want capabilities that will give us a decisive advantage." SBA is one of these capabilities that must be fully developed to help provide U. S. warfighters with such an advantage.

VIII. Abbreviations / Glossary

Domain. The physical or abstract space in which the entities and processes operate. The domain can be land, sea, air, space, undersea, a combination of any of the above, or an abstract domain, such as an n-dimensional mathematics space, or economic or psychological domains.[9]

Enterprise. An arbitrarily-defined functional and administrative entity that exists to perform a specific, integrated set of missions and achieve associated goals and objectives, encompassing all of the primary functions necessary to perform those missions.[9]

Entity. A distinguishable person, place, unit, thing, event, or concept about which information is kept.[5]

HLA. High Level Architecture.

Model. An accurate physical, mathematical, or other logical representation of an entity, system, or process.

SBA. Simulation Based Acquisition.

Simulation. An automated environment for processing a system model over time in order to study its behavior and performance.

SMART. Simulation and Modeling for Acquisition, Requirements, and Training.

IX. Related Internet Sites

AF Directorate for Command & Control	http://xom.hq.af.mil/
AF M&S Resource Repository	http://afmsrr.sc.ist.ucf.edu/
AFMC M&S TPIPT	http://www.afbmd.laafb.af.mil/xre/m&s/
AFOTEC	http://www.afotec.af.mil/
Army M&S Catalog (AMSCAT)	http://www.msrr.army.mil/inven.htm
Army M&S Master Plan	http://www.amso.army.mil/
Army M&S Office	http://www.amso.army.mil/
Army M&S Resource Repository	http://www.msrr.army.mil/
Army SBA Conference Web Site	http://sba.iitri.org
DMSO	http://www.dmso.mil
DMSO Master Environment Library	http://www-mel.nrlmry.navy/mil
DMSTTIAC	http://dmsttiac.iitri.org
DoD Master Plan	http://www.dmso.mil/docslib/#mspolicy
HLA	http://dmso.nil/projects/hla/
JADS JTF	http://jadsweb.kirtland.af.mil/
JDBE	http://www.jdbe.epgc4i.com/
Joint Accreditation Support Activity	http://nawcwpns.navy.mil/~jasa/
Joint M&S Inventory Master Plan	http://www.msosa.mil.inter.net/jmsmemo.htm
JMASS	http://www.jmass.wpafb.af.mil/
JSIMS	http://www.jsims.mil/
JWARS Office	http://www.dtic.mil/jwars/
MSOSA	http://www.msosa.mil.inter.net/
MSRR	http://www.msrr.dmso.mil/
Navy M&S Information System	http://navmsmo/hq/navy.mil//nmsiscat/
Navy M&S Management Office	http://navmsmo.nosc.mil/navmsmo.htm
Navy T&E M&S Management Office	http://www.nawcad.navy.mil/tems/index.html
Navy T&E Repository for M&S	http://nterms.mugu.navy.mil/
NPS Modeling, Virtual Environments & Simualation Curriculum	http://www.net.nps.navy.mil/moves/
SBA Roadmap	http://www.acq-ref.navy.mil/sba/.
SBA Special Interest Area	http://www.msosa.dmso.mil/sia-sba/default.asp
Secretary of the Army for Research Development & Acquisition	http://www.sarda.army.mil
Software Technology Support Center	http://stscols.hill.af.mil
STEP Guidelines	http://www.acq.osd.mil/te/programs/tfr/step.htm
TENA	http://c38.npt.nuwc.navy.mil/TENA/home.html
Terrain Modeling Project Office	http://tmpo.nima.mil:8001/

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